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Archaeology and landscape features in Magnetometer Data

Immo HESKE* and Martin POSSELT**

Key words: Archaeological feedback, Magnetometry, Landscape archaeology, Neolithic, Bronze age, Iron age.

Geophysics, especially magnetometry, right now has become famous for detecting archeological features and mapping entire archaeological sites (Gaffney 2008). It allows to map pits, fortifications, buildings, post holes, graves etc. without excavation *i. e.* destruction. Nevertheless, since magnetometry plots any type of magnetic anomalies including modern disturbances and natural e. g. geological structures, it also maps the natural environment of the site. Geophysics allow to detect features concerning the history of the landscape generally (Kvamme 2003). On the one hand human beings always have shaped the landscape they lived in and their decision to settle in a certain place depended on special landscape features also. On the other hand today's face of the natural environment in fact is highly artificially shaped or has changed due to natural processes. Recently within landscape archaeology researchers are not interested in the sites merely but also in why and how people have settled in a certain landscape (Schade 2000). The paper at hand aims to picture that recent geophysical surveys have detected archaeological features of sites and also features of the landscape the site is placed in: silt up ancient streams, areas of erosion and accumulation, former systems of cultivation of soils etc. Archaeological interpretation of the geophysical data and its integration into the results of other disciplines changes the archaeologist's point of view as well as the research strategy (Meyer 2007). Also within the framework of landscape

archaeology geophysics does not detect archaeological features merely but also elements of the natural setting in between settlements. While geophysics maps structures buried underneath invisible to modern men but which were part of the ancient landscape which prehistoric men found for placing his settlements, an assessment of the initial landscape can be gained and conclusions concerning the criteria for placing a settlement can be found (e. g. water supply, situation of functional areas [areas of agriculture, metallurgical areas, limitations of the settlements]).

This subject is pictured by the case study of a site in Lower Saxony, Germany, called "Hünenburg" (Gevensleben-Watenstedt) which is well known as a hillfort fencing in an area of about 2.5 ha defined by a rampart as well as steep slopes. Right now the site is investigated in the course of a research project by the University of Göttingen financed by the Deutsche Forschungsgemeinschaft. The Hünenburg has been settled on from Neolithic until Early medieval periods (Heske 2000, 2003). It is situated on a spur of a high ridge ranging up to 100 m above its surroundings including the large low-lying areas of the Großes Bruch to the south. In its beginning research at the Hünenburg focused on the hillfort with its rampart and fenced in settlement areas. Its environs bear further sites comprising graves, deposits and areas of else surface findings. Especially the latter were found at the southern slope of the hillfort but were not seen as a remnant

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of a separate settlement outside the ramparts. They were interpreted as the product of erosion of the hillfort down its steep slopes.

In 2001 a magnetometer survey was initialized to prove whether the surface findings from the southern slope of the hillfort are produced by a contemporary settlement outside the ramparts instead (Posselt 2001). An answer to this question would allow conclusions concerning the function and place in the hierarchy of the settlement system throughout the surrounding landscape. Finally the initial magnetometer surveys as well as further campaigns until 2008 were successful in detecting an extensive coherent settlement area to the south and west of the Hünenburg. Until now an area of about 18 hectares is surveyed (Fig. 1). The survey was done using a four channel Fluxgatemagnetometer (Förster Ferex). The archaeological features extend throughout almost the whole investigation area. According to magnetogram the settlement seems to continue to the west and to the south. Yet it is not proven of what age the sections of the settlement are. The detailed small scale excavations (Fig. 2) yet undertaken have gained some information about character and age of the features.

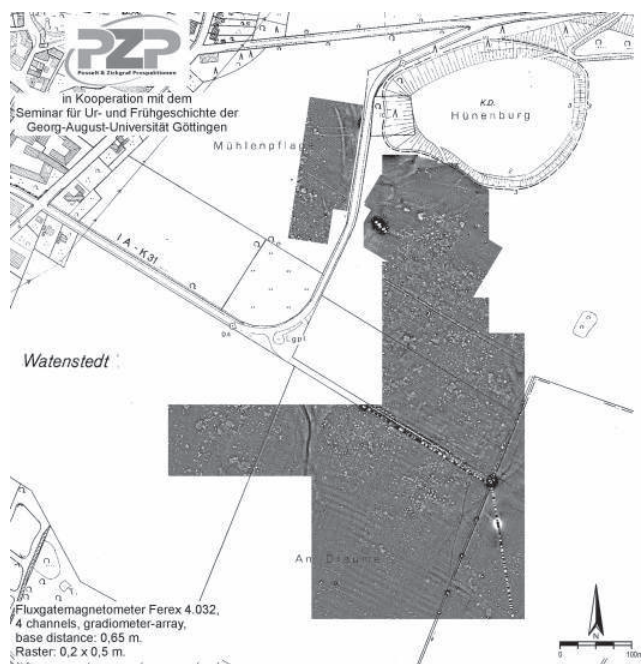


Figure 1: Gevensleben-Watenstedt. Hillfort and settlement „Hünenburg“. Total magnetogram from the settlement south of the hillfort. State: September 2008 (map courtesy of PZP/Seminar für Ur- und Frühgeschichte Göttingen).



Figure 2: Gevensleben-Watenstedt. Hillfort and settlement „Hünenburg“. Airphoto summer 2008, from west (photo courtesy of Andreas Gruetemann).

Beside numerous small features (waste pits, etc.) the magnetogram (Fig. 3) shows large anomalies, which usually would be interpreted as geological patterns. But excavations have proven, that such anomalies are produced by cultural layers below the topsoil of some decimetres in thickness covering further small features (Heske *et al.* 2009). Some of these cultural layers extend up to hectares in size. Excavations could identify the numerous small features as the usual waste pits, storage pits, post holes etc. Unusually also graves were found within the settlement area. Furthermore in the places of high magnetic amplitudes conglomerations of stones have been found, which then could be interpreted as hearths or ovens (Heske 2002, 2007). Several groups of these ovens can be identified throughout the ca. 18 ha magnetogram.

On the one hand the site presents its features extraordinarily well preserved. On the other hand the huge size of the settlement area has remained unrecognized for long time. The reason therefore could be, that a medieval agricultural systems (Wölbäcker), also detected by magnetometry as broad weak lineaments, have prevented a huge amount of the site from destruction by ploughing. In fact there seems to be a negative correlation of the visibility of the lines of the medieval agricultural system and the prehistoric features in the magnetogram. This phenomenon allows to conclude that areas of excellent visibility of Wölbäcker-structures may hide supposed archaeological features completely. For such areas magnetometry needs to be substituted by other field-methods, but in case archaeological features do exist they should be preserved in a quite good state. The excellent state of preservation of archaeological features is quite seldom within middle-Europe especially in the case of soils used for intensive agriculture.

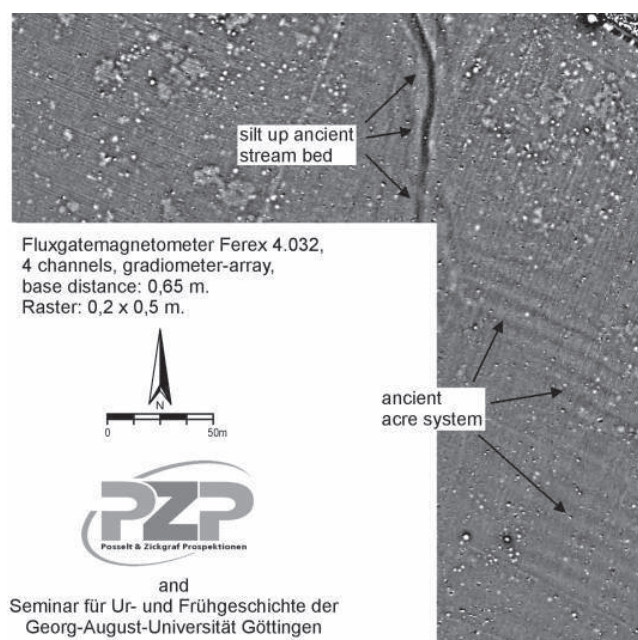


Figure 3: Gevensleben-Watenstedt. Hillfort and settlement „Hünenburg“. Detail of the magnetogram from the settlement south of the hillfort including archaeological features, landscape features and medieval acre systems. State: September 2008 (map courtesy of PZP/Seminar für Ur – und Frühgeschichte Göttingen).

Furthermore a system of stream beds, partly silt up or changed in course heavily due to natural processes or for meliorization reasons was revealed by magnetometry. Today the surroundings of the Hünenburg are coined by extensive acres and willows. The nearest body of water is the stream Soltau situated some 900 m southwest of the hillfort, while the area inbetween is an acre prepared for up to date industrial agriculture without any natural structures and obstacles. In one case further east of the site a ditch for water drainage runs dead straight aside a margin of an acre. But the results of magnetometer survey have changed our view of that part of the landscape. It was used for settlements and according activities throughout several periods of prehistoric ages according to magnetic data. A system of a huge settlement area towered above by an hillfort. Furthermore – as magnetically detected stream beds prove (Fig. 3) – the settlements were placed in a natural system of water supply and drainage much more detailed than the recent landscape gives the impression. The reconstruction of the initial situation of the landscape which prehistoric men found at the scene might allow further arguments concerning history and function of the settlement. Which elements of such a settlement system and the landscape are of the same age and what function

they have has to be researched in much more detail yet. Nevertheless in the case of the Hünenburg magnetometry changed the perspective of the archaeologist when investigating why men decided where to place settlements and how to use the landscape concerning water supply, use of natural resources and areas useful to place dwellings.

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